

Department of Environmental Quality  
Division of INL Oversight  
and Radiation Control

## **ENVIRONMENTAL SURVEILLANCE PROGRAM QUARTERLY DATA REPORT**

**January - March, 2005**



<b>State of Idaho</b>	
<b>Division of INL Oversight and Radiation Control</b>	
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# Table of Acronyms

BEA	-	Battelle Energy Alliance, LLC	NIST	-	National Institute of Standards and Technology
CERCLA	-	Comprehensive Environmental Response Compensation and Liability Act	nCi/L	-	nanocuries per liter
CFA	-	Central Facilities Area	NOAA	-	National Oceanic and Atmospheric Administration
CWI	-	CH2M-WG Idaho, LLC	NRF	-	Naval Reactors Facility
DEQ-INL	-	The State of Idaho, Division of Idaho National Laboratory Oversight and Radiation Control	pCi/L	-	picocuries per liter
DOE	-	U.S. Department of Energy	pCi/m <sup>3</sup>	-	picocuries per cubic meter
EIC	-	electret ionization chamber	PM <sub>10</sub>	-	particulate matter with aerodynamic diameter less than or equal to 10 micrometers
EML	-	Environmental Monitoring Laboratory	PCE	-	perchloroethene
EPA	-	Environmental Protection Agency	QAPP	-	Quality Assurance Program Plan
ESER	-	Environmental Surveillance Education and Research Program (SM Stoller)	QA/QC	-	Quality Assurance/Quality Control
ESP	-	Environmental Surveillance Program	RCRA	-	Resource Conservation and Recovery Act
HPIC	-	high-pressure ion chamber	RPD	-	relative percent difference
LLD	-	lower limit of detection	RWMC	-	Radioactive Waste Management Complex
IBL	-	Idaho Bureau of Laboratories	RTC	-	Reactor Technology Complex
INL	-	Idaho National Laboratory	SD	-	standard deviation
INTEC	-	Idaho Nuclear Technology and Engineering Center	SMCL	-	secondary maximum contaminant level
LSC	-	liquid scintillation counting	TAN	-	Test Area North
MFC	-	Materials and Fuels Complex	TCE	-	trichloroethene
µg/L	-	micrograms per liter	TDS	-	total dissolved solids
mg/L	-	milligrams per liter	TMI	-	Three Mile Island
mR/hr	-	milliRoentgen per hour	TSP	-	total suspended particulate
µR/hr	-	microRoentgen per hour	TSS	-	total suspended solids
MCL	-	maximum contaminate level	USGS	-	U.S. Geological Survey
MDA	-	minimum detectable activity	VOC	-	volatile organic compound
MDC	-	minimum detectable concentration	WLAP	-	Wastewater Land Application

# Introduction

The state of Idaho, Division of Idaho National Laboratory Oversight and Radiation Control (DEQ-INL) Environmental Surveillance Program (ESP) is conducted at locations on the INL, on the boundaries of the INL, and at distant locations to the INL in accordance with accepted monitoring procedures and management practices. This program is designed to provide the people of the state of Idaho with independently evaluated information about the impacts of the Department of Energy's (DOE) activities in Idaho.

The primary objective for DEQ-INL's ESP is to maintain an independent environmental monitoring and verification program designed to verify and supplement DOE's data and programs. This program is also used to provide the citizens of Idaho with information that has been independently evaluated to enable them to reach informed conclusions about DOE activities in Idaho and potential impacts to public health and the environment.

Results of the ESP are published using two distinct reporting formats: quarterly data reports and an annual ESP report. The annual ESP report is designed for a more broad audience and summarizes the results of the ESP for the previous four quarters. The annual report's primary emphasis is to focus on trends, ascertain the impacts of DOE operations on the environment, and confirm the validity of DOE monitoring programs. This quarterly report is designed to provide the mechanism to document the results of the ESP on a quarterly basis and provide detailed data to those who wish to "see the numbers." It is organized according to the media sampled and also provides a quality assurance assessment.

## Air and Precipitation Monitoring Results

The ESP operated eight air monitoring stations on and near the INL as well as two monitoring stations distant from the INL during the first quarter, 2005 (**Figure 1**). These stations employed instrumentation for collecting airborne particulate matter (TSP and PM<sub>10</sub>), gaseous radioiodine, precipitation, and water vapor for tritium analysis (**Table 1**). The Shoshone-Bannock Tribes operated an air monitoring station located at Fort Hall. The Fort Hall station uses identical instrumentation and sampling protocol as the ten stations operated by the ESP. The DEQ-INL reports the Fort Hall station data as an additional background site.

The high-volume Total Suspended Particulate (TSP) air sampler is the DEQ-INL's primary air sampler. During the first quarter of 2005, two PM<sub>10</sub> samplers collected supplementary air data, along with radioiodine, at Mud Lake, and Atomic City.

Weekly gross alpha and gross beta radioactivity results for filters from the TSP samplers are presented in **Appendix A** and summarized in **Table 2**. Gross alpha and gross beta radioactivity concentrations reported from the particulate samples were within the range of expected values for naturally occurring radioactivity observed historically.

Weekly gross alpha and gross beta radioactivity results for the PM<sub>10</sub> particulate air filters are presented in **Appendix B** and summarized in **Table 3**. Gross alpha and gross beta radioactivity concentrations reported from the particulate samples were within the range of expected values for naturally occurring radioactivity.

Composites of filters collected using TSP samplers and PM<sub>10</sub> samplers during the course of a calendar quarter are analyzed using gamma spectroscopy. Typically, gamma spectroscopy results are only reported when exceeding a minimum detectable activity (MDA) or minimum detectable concentration (MDC). Gamma spectroscopy results for the first quarter of 2005 for TSP filters are presented in **Table 4** and

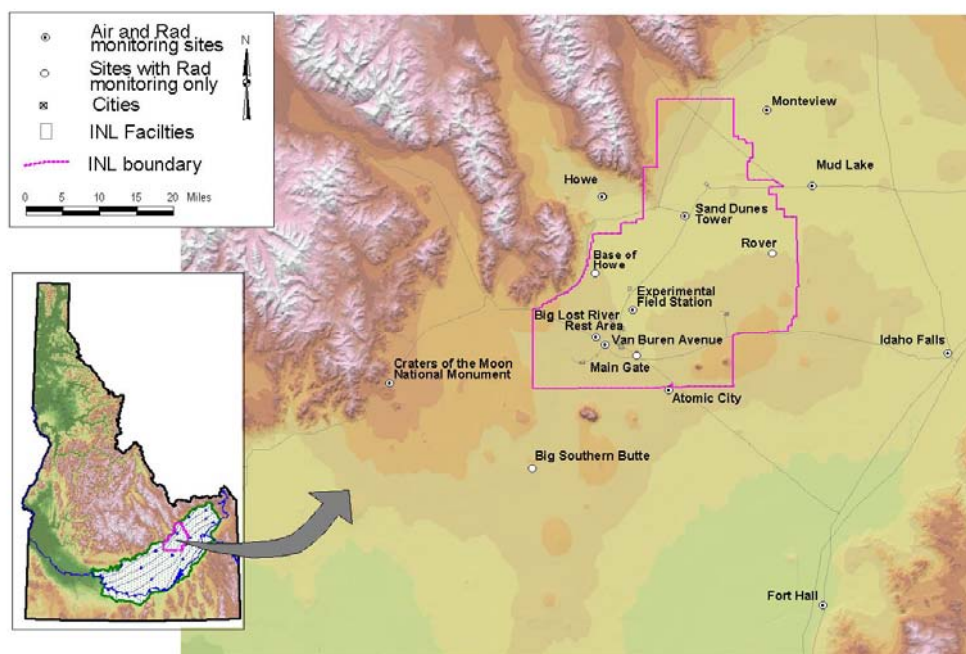
gamma spectroscopy results for PM<sub>10</sub> filters are presented in **Table 5**. The only reported gamma-emitting radionuclide was beryllium-7, a naturally occurring, cosmogenic radionuclide.

Annual composites of filters collected using TSP samplers and PM<sub>10</sub> samplers are analyzed using radiochemical separation techniques. The samples are analyzed for strontium-90, plutonium-238, plutonium-239/240, and americium-241. The results of radiochemical separation can be found in **Table 6** and **Table 7**. Results indicate activity concentrations exceeding the MDC, but well below INL OP action levels for the specific radionuclides. Action levels have been conservatively established to indicate whether or not elevated levels of radioactivity require further investigation. Action levels are assigned based on doses resulting from the inhalation of specific radionuclides. Measurable quantities of these radionuclides are expected in the environment due to historic above ground testing of nuclear weapons.

No radioactive isotopes of iodine, specifically iodine-131, were detected on the weekly charcoal cartridges.

Atmospheric moisture samples were collected at eleven locations and analyzed for tritium. Atmospheric tritium concentrations were determined using the amount of tritium measured in the atmospheric moisture collected, the quantity of atmospheric moisture collected, and the volume of air sampled. Reported values are the result of either a single sample or a weighted mean when more than one atmospheric moisture sample was collected during the calendar quarter. Atmospheric tritium was not detected at on-site or offsite locations during the first quarter of 2005. Average atmospheric tritium concentrations are presented in **Table 8**.

Precipitation samples were collected at six monitoring locations during the first quarter of 2005. Precipitation samples are analyzed for tritium and gamma-emitting radionuclides. Tritium and gamma-emitting radionuclides were below minimum detectable concentration in precipitation collected during the first quarter of 2005. Tritium and cesium-137 analysis results are presented in **Table 9**. Reported values are either the result of a single sample or a weighted mean when more than one precipitation sample was collected during the calendar quarter.



**Figure 1.** Air and radiation monitoring sites.

**Table 1.** Sampling locations and sample type.

Station Locations	Sample type <sup>1</sup>				
	PM <sub>10</sub>	TSP	Radioiodine	Water Vapor	Precipitation
<b>On-site Locations</b>					
Big Lost River Rest Area		<input type="checkbox"/>	<input type="checkbox"/>	■	■
Experimental Field Station		<input type="checkbox"/>	<input type="checkbox"/>	■	
Sand Dunes Tower		<input type="checkbox"/>	<input type="checkbox"/>	■	
Van Buren Avenue		<input type="checkbox"/>	<input type="checkbox"/>	■	
<b>Boundary Locations</b>					
Atomic City	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	■	■
Howe		<input type="checkbox"/>	<input type="checkbox"/>	■	■
Montevue		<input type="checkbox"/>	<input type="checkbox"/>	■	■
Mud Lake	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	■	■
<b>Distant Locations</b>					
Craters of the Moon		<input type="checkbox"/>	<input type="checkbox"/>	■	
Fort Hall <sup>2</sup>		<input type="checkbox"/>	<input type="checkbox"/>	■	
Idaho Falls		<input type="checkbox"/>	<input type="checkbox"/>	■	■
<sup>1</sup> <input type="checkbox"/> Samples collected weekly; ■ Samples collected quarterly. <sup>2</sup> Operated by Shoshone-Bannock Tribes.					

**Table 2.** Range of alpha and beta concentrations for TSP filters, first quarter, 2005. Concentrations are reported in  $1 \times 10^{-3}$  pCi/m<sup>3</sup>.

Station Location	Concentration					
	Gross Alpha			Gross Beta		
On-Site Locations						
Big Lost River Rest Area	0.1	-	1.4	13.2	-	52.6
Experimental Field Station	0.2	-	1.3	11.4	-	64.3
Sand Dunes Tower	0.2	-	1.3	13.1	-	74.1
Van Buren Avenue	0.4	-	1.3	12.0	-	54.5
Boundary Locations						
Atomic City	0.1	-	1.5	16.1	-	62.7
Howe	0.3	-	1.4	13.8	-	47.2
Montevue	0.3	-	1.6	15.2	-	78.0
Mud Lake	0.4	-	1.3	13.1	-	74.1
Distant Locations						
Craters of the Moon	0.1	-	0.8	10.5	-	38.9
Fort Hall <sup>1</sup>	0.2	-	2.0	14.9	-	49.3
Idaho Falls	0.3	-	1.5	12.4	-	61.5
<sup>1</sup> Operated by Shoshone-Bannock Tribes.						

**Table 3.** Range of alpha and beta concentrations for PM<sub>10</sub> filters, first quarter, 2005. Concentrations are reported in  $1 \times 10^{-3}$  pCi/m<sup>3</sup>.

Station Location	Concentration					
	Gross Alpha			Gross Beta		
Boundary Locations						
Atomic City	0.1	-	1.3	24.5	-	67.5
Mud Lake	-0.1	-	1.4	12.9	-	86.9

**Table 4.** Gamma spectroscopy analysis data of TSP filters, composite sample, first quarter, 2005. Concentrations are reported in  $1 \times 10^{-3}$  pCi/m<sup>3</sup> with associated uncertainty ( $\pm 2$  SD), minimum detectable concentration (MDC), and correspond to filter composites collected during the calendar quarter.

Station Location	Naturally Occurring Radionuclide Beryllium-7		Man-Made Gamma Emitting Radionuclides
	Concentration	± 2 SD	
<b>On-site Locations</b>			
Big Lost River Rest Area	54	3	<MDC
Experimental Field Station	52	3	<MDC
Sand Dunes Tower	53	3	<MDC
Van Buren Avenue	64	4	<MDC
<b>Boundary Locations</b>			
Atomic City	62	3	<MDC
Howe	60	3	<MDC
Montevieu	56	3	<MDC
Mud Lake	48	3	<MDC
<b>Distant Locations</b>			
Craters of the Moon	60	3	<MDC
Fort Hall <sup>1</sup>	53	3	<MDC
Idaho Falls	57	3	<MDC

<sup>1</sup> Operated by Shoshone-Bannock Tribes.

**Table 5.** Gamma spectroscopy analysis data of PM<sub>10</sub> filters, composite sample, first quarter, 2005. Concentrations are reported in  $1 \times 10^{-3}$  pCi/m<sup>3</sup> with associated uncertainty ( $\pm 2$  SD), minimum detectable concentration (MDC), and correspond to filter composites collected during the calendar quarter.

Station Location	Naturally Occurring Radionuclide Beryllium-7		Man-Made Gamma Emitting Radionuclides
	Concentration	± 2 SD	
Boundary Locations			
Atomic City	57	4	<MDC
Mud Lake	77	5	<MDC

**Table 6.** Annual radiochemical separation analysis data for TSP particulate filters collected during 2004. These concentrations are reported in  $1 \times 10^{-6}$  pCi/m<sup>3</sup>, with associated uncertainty ( $\pm 2$  SD), minimum detectable concentration (MDC), and correspond to filter composites collected during the calendar year.

Station Location	Americium-241			Strontium-90		
	Concentration	$\pm 2$ SD	MDC	Concentration	$\pm 2$ SD	MDC
<b>On-Site Locations</b>						
Big Lost River Rest Area	0.4	0.7	1.0	38.3 <sup>2</sup>	17.3	21.7
Experimental Field Station	0.7	1.0	1.0	53.9 <sup>2</sup>	18.3	19.8
Sand Dunes Tower	1.1 <sup>3</sup>	1.2	0.9	26.8 <sup>2</sup>	13.8	17.8
Van Buren Avenue	0.7	1.0	1.0	34.2 <sup>2</sup>	15.6	18.9
<b>Boundary Locations</b>						
Atomic City	0.4	0.8	1.0	31.1 <sup>2</sup>	16.3	22.0
Howe	1.5 <sup>3</sup>	1.5	1.0	34.2 <sup>2</sup>	18.2	25.0
Montevieu	0.0	0.0	0.9	56.6 <sup>2</sup>	17.0	17.3
Mud Lake	0.2	0.7	1.6	31.2 <sup>2</sup>	17.1	23.2
<b>Distant Locations</b>						
Craters of the Moon	1.0	1.4	1.9	73.2 <sup>2</sup>	20.8	19.9
Fort Hall <sup>1</sup>	0.7	1.0	1.0	23.7 <sup>2</sup>	14.9	21.1
Idaho Falls	0.9	1.2	1.6	67.1 <sup>2</sup>	19.9	20.6

<sup>1</sup> Operated by Shoshone-Bannock Tribes  
<sup>2</sup> Activity is less than 5% of the Oversight Program's action level. Measurable quantities of these radionuclides are expected in the environment due to historic above ground testing of nuclear weapons.

**Table 6 continued.** Annual radiochemical separation analysis data for TSP particulate filters collected during 2004. These concentrations are reported in  $1 \times 10^{-6}$  pCi/m<sup>3</sup>, with associated uncertainty ( $\pm 2$  SD), minimum detectable concentration (MDC), and correspond to filter composites collected during the calendar year.

Station Location	Plutonium-238			Plutonium-239/240		
	Concentration	$\pm 2$ SD	MDC	Concentration	$\pm 2$ SD	MDC
<b>On-Site Locations</b>						
Big Lost River Rest Area	0.0	0.0	1.0	0.4	0.7	1.0
Experimental Field Station	0.7	1.0	1.0	0.0	0.0	1.0
Sand Dunes Tower	0.0	0.0	0.8	0.2	0.6	1.4
Van Buren Avenue	0.0	0.0	1.0	0.2	0.8	1.8
<b>Boundary Locations</b>						
Atomic City	-0.2	0.3	19.7	0.8	1.2	1.1
Howe	0.2	0.8	1.7	-0.1	0.3	1.7
Montevieu	0.6	0.9	0.9	0.3	0.6	0.9
Mud Lake	0.3	0.7	0.9	0.7	1.0	0.9
<b>Distant Locations</b>						
Craters of the Moon	0.4	0.8	1.1	1.2 <sup>2</sup>	1.4	1.1
Fort Hall <sup>1</sup>	0.0	0.0	0.8	1.2 <sup>2</sup>	1.2	0.8
Idaho Falls	0.3	0.6	0.9	0.2	0.7	1.5

<sup>1</sup> Operated by Shoshone-Bannock Tribes  
<sup>2</sup> Activity is less than 5% of the Oversight Program's action level. Measurable quantities of these radionuclides are expected in the environment due to historic above ground testing of nuclear weapons.

**Table 7.** Annual radiochemical separation analysis data for PM<sub>10</sub> particulate filters collected during 2004. These concentrations are reported in  $1 \times 10^{-6}$  pCi/m<sup>3</sup>, with associated uncertainty ( $\pm 2$  SD), minimum detectable concentration (MDC), and correspond to filter composites collected during the calendar year.

Station Location	Americium-241			Strontium-90		
	Concentration	$\pm 2$ SD	MDC	Concentration	$\pm 2$ SD	MDC
<b>Boundary Locations</b>						
Atomic City	0.6	1.2	1.7	33.0 <sup>1</sup>	22.8	32.6
Mud Lake	0.7	1.3	1.8	64.3 <sup>1</sup>	27.7	33.2
<sup>1</sup> Activity is less than 5% of the Oversight Program's action level. Measurable quantities of these radionuclides are expected in the environment due to historic above ground testing of nuclear weapons.						

**Table 7 continued.** Annual radiochemical separation analysis data for PM<sub>10</sub> particulate filters collected during 2004. These concentrations are reported in  $1 \times 10^{-6}$  pCi/m<sup>3</sup>, with associated uncertainty ( $\pm 2$  SD), minimum detectable concentration (MDC), and correspond to filter composites collected during the calendar year.

Station Location	Plutonium-238			Plutonium-239/240		
	Concentration	$\pm 2$ SD	MDC	Concentration	$\pm 2$ SD	MDC
<b>Boundary Locations</b>						
Atomic City	-0.2	0.5	2.8	0.6	1.2	1.6
Mud Lake	0.0	0.0	1.6	-0.2	0.5	2.8

**Table 8.** Tritium concentrations from atmospheric moisture, first quarter, 2005. Concentrations are reported in pCi/m<sup>3</sup> with associated uncertainty ( $\pm 2$  SD) and minimum detectable concentration (MDC).

Station Location	Tritium		
	Concentration	$\pm 2$ SD	MDC
<b>On-site Locations</b>			
Big Lost River Rest Area	0.02	0.09	0.15
Experimental Field Station	0.09	0.17	0.29
Sand Dunes Tower	0.12	0.19	0.33
Van Buren Avenue	0.07	0.15	0.26
<b>Boundary Locations</b>			
Atomic City	0.07	0.17	0.29
Howe	-0.03	0.09	0.16
Mud Lake	0.17	0.20	0.34
Montevue	0.08	0.18	0.30
<b>Distant Locations</b>			
Craters of the Moon	-0.01	0.19	0.32
Fort Hall	0.14	0.22	0.38
Idaho Falls	0.03	0.20	0.35



**Table 9.** Tritium and cesium-137 concentrations from precipitation, first quarter, 2005. Concentrations are reported in pCi/L with associated uncertainty ( $\pm 2$  SD) and minimum detectable concentration (MDC).

Station Location	Tritium			Cesium-137		
	Concentration	$\pm 2$ SD	MDC	Concentration	$\pm 2$ SD	MDC
<b>On-site Locations</b>						
Big Lost River Rest Area	40	70	120	-0.7	1.4	2.4
<b>Boundary Locations</b>						
Atomic City	0	70	120	0.2	1.5	2.6
Howe	20	70	120	0.8	1.4	2.3
Montevue	0	70	120	0.4	1.7	3.0
Mud Lake	60	70	120	-1.1	1.7	2.9
<b>Distant Locations</b>						
Idaho Falls	30	70	120	-0.2	1.5	2.6

## Environmental Radiation Monitoring Results

The ESP operated 14 environmental radiation stations during the first quarter of 2005 (**Figure 1**). Each of these stations is instrumented with an electret ionization chamber (EIC), and 11 of the stations also have high-pressure ion chambers (HPIC) (**Table 10**). The Shoshone-Bannock Tribes operate an additional environmental radiation station at Fort Hall equipped with both an EIC and HPIC. The DEQ-INL reports these results.

HPICs are instruments capable of real-time measurements, and therefore can detect small changes in gamma radiation levels over time. Since HPICs offer real-time gamma radiation measurement and data acquisition, DEQ-INL collects this information electronically and provides graphed data via the world wide web at [www.idahoop.org](http://www.idahoop.org). EICs are a passive integrating system that provides a cumulative measure of environmental gamma radiation exposure. DEQ-INL compared the exposure rates measured by EICs and HPICs and observed that the data correlated very well from both measurement methods; although, EICs tend to over respond by approximately 20 percent, accounting for the slight differences observed between the two measurements. A complete analysis of the radiation measuring devices can be found in *A Comparison of Three Methods for Measuring Environmental Radiation*, Moser, Kristi, Idaho State University, M.S.Thesis, 2002. Each system is used by DEQ-INL to measure gamma radiation for various radiological monitoring objectives. EICs offer an inexpensive methodology to measure gamma radiation over a wide area, particularly in regions which do not have a power source. EICs can also provide valuable gamma radiation data in the event of an emergency. It is because of this reason that EICs are also deployed at 78 locations by DEQ-INL in a widespread network around the INL measuring general background radiation. This information is tabulated in **Appendix C**.

**Table 11** lists the average radiation exposure rates measured by the HPICs for the quarter. Exposure rates were within the expected range of values for historical background radiation. **Table 12** lists the EIC monitoring results for first quarter, 2005, which are denoted as estimated values because of a quality control problem summarized in the “Quality Assurance” section of the report.

**Table 10.** Summary of instrumentation at radiation monitoring stations.

Station Location	Instrument Type	
	HPIC	EIC
<b>Onsite Locations</b>		
Base of Howe	■	■
Big Lost River Rest Area	■	■
Experimental Field Station		■
Main Gate	■	■
Rover	■	■
Sand Dunes Tower	■	■
Van Buren Avenue		■
<b>Boundary Locations</b>		
Atomic City	■	■
Big Southern Butte	■	■
Howe	■	■
Monteview	■	■
Mud Lake	■	■
<b>Distant Locations</b>		
Craters of the Moon		■
Fort Hall <sup>1</sup>	■	■
Idaho Falls	■	■
<sup>1</sup> HPIC operated by Shoshone-Bannock Tribes with the EIC maintained by DEQ-INL.		

**Table 11.** Average gamma exposure rates for first quarter, 2005, from HPIC network. These rates are expressed in  $\mu\text{R/hr}$ .

Station Location	Exposure Rate	
	Quarterly Average	$\pm 2 \text{ SD}$
<b>Onsite Locations</b>		
Base of Howe	10.7	1.0
Big Lost River Rest Area	12.3	1.4
Main Gate	13.0	1.0
Rover	13.0	1.0
Sand Dunes Tower	12.7	1.1
<b>Boundary Locations</b>		
Atomic City	11.4	1.2
Big Southern Butte	10.9	2.4
Howe	11.5	0.9
Monteview	11.9	0.8
Mud Lake	11.0	0.8
<b>Distant Locations</b>		
Fort Hall <sup>1</sup>	11.7	1.1
Idaho Falls	11.1	0.8
<sup>1</sup> Operated by Shoshone-Bannock Tribes.		

**Table 12.** Electret Ionization chamber (EIC) cumulative average exposure rates<sup>1</sup> for first quarter, 2005. These rates are expressed in  $\mu\text{R/hr}$ .

Station Location	Exposure Rate	
	Total	$\pm 2 \text{ SD}$
<b>Onsite Locations</b>		
Base of Howe	15.8 J	1.6
Big Lost River Rest Area	19.3 J	2.4
Experimental Field Station	23.7 J	2.1
Main Gate	20.5 J	2.0
Rover	18.2 J	1.7
Sand Dunes Tower	20.3 J	2.0
Van Buren Avenue	21.2 J	2.0
<b>Boundary Locations</b>		
Atomic City	18.9 J	1.9
Big Southern Butte	15.9 J	1.5
Howe	16.5 J	1.9
Monteview	16.0 J	1.8
Mud Lake	16.7 J	1.9
<b>Distant Locations</b>		
Craters of the Moon	17.6 J	1.9
Fort Hall	17.5 J	1.9
Idaho Falls	16.8 J	1.9

<sup>1</sup> Data qualifiers: U = non-detection, J = estimate, R = rejected.

## Water Monitoring & Verification Results

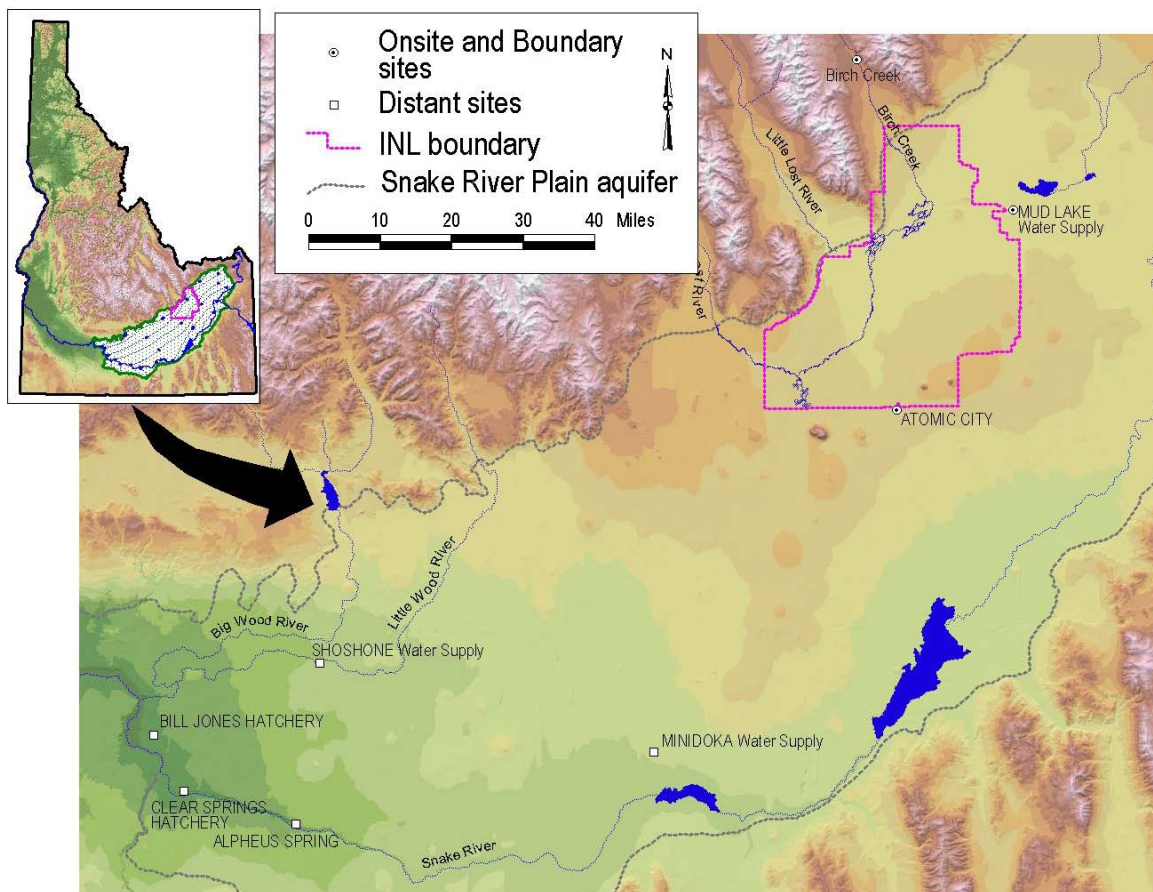
### Water Monitoring Program

Water monitoring sites are sampled for the purposes of examining trends of key INL contaminants and general groundwater quality indicators. These sites are grouped by location; on the INL or its boundary, offsite and distant from the INL, and surface water sites. Sites are typically co-sampled with the USGS or DOE's environmental monitoring contractor. Seven water monitoring locations were sampled during the first quarter of 2005, two locations were bounding the INL and five locations were distant from the INL. (**Figure 2**).

Gross alpha radioactivity was not detected in any samples, while gross beta radioactivity was detected in samples from all sites--two boundary locations and five distant locations for the current calendar quarter. Detectable gross beta activity ranged from  $1.8 \pm 0.9$  to  $3.8 \pm 0.9$  pCi/L for boundary locations and  $2.3 \pm 0.9$  to  $5.3 \pm 1.1$  pCi/L for offsite and distant locations. The concentrations of gross beta activity were consistent with historical results and were within expected ranges. No man-made gamma emitting radionuclides were identified via gamma spectroscopic analysis. Results for gross alpha, gross beta, and man-made gamma emitting radioactivity are shown in **Table 13**.

Gross beta analyses are also conducted as a screening tool for beta emitting radionuclides potentially released due to INL operations. In the event of suspect, known high, or unexpected levels of gross beta radioactivity, samples may also be analyzed for technetium-99 and strontium-90. No samples were analyzed for technetium-99 or strontium-90 this quarter.

Using the standard analytical method, tritium was not detected in any samples (**Table 14**). Water samples with tritium concentrations not detectable using the standard method (MDC of 160 pCi/L) are analyzed using an electrolytic enrichment method with a much lower MDC of 10 to 14 pCi/L. The analytical results for these samples are presented in **Table 15**. Tritium was detected in two samples at distant locations using the electrolytic enrichment method, and ranged from  $17 \pm 7$  pCi/L to  $25 \pm 7$  pCi/L. All results were within their expected ranges and were below the MCL for tritium of 20,000 pCi/L.



**Figure 2.** Water monitoring locations.

**Table 13.** Alpha, beta, and gamma concentrations<sup>1</sup> for water monitoring samples, first quarter, 2005. Concentrations are expressed in pCi/L.

Sample Location	Sample Date	Gross Alpha		Gross Beta		Man-made gamma-emitting radionuclide Cesium-137
		Concentration	± 2 SD	Concentration	± 2 SD	Concentration
Onsite and Boundary						
Atomic City	2/11/2005	-0.1 U	1.9	1.8	0.9	<MDC
Mud Lake Water Supply	2/11/2005	-0.7 U	1.1	3.8	0.9	<MDC
Offsite and Distant						
Alpheus Spring	2/8/2005	-0.9U	2.6	5.3	1.1	<MDC
Bill Jones Hatchery	2/8/2005	-1.5 U	1.6	2.3	0.9	<MDC
Clear Springs Hatchery	2/8/2005	-0.8 U	2.0	3.7	1.0	<MDC
Minidoka Water Supply	2/8/2005	0.8 U	2.1	2.6	1.0	<MDC
Shoshone Water Supply	2/8/2005	1.9 U	1.8	2.8	1.0	<MDC
<sup>1</sup> Data qualifiers: U = non-detection, J = estimate, R = rejected. <MDC – Less than minimum detectable concentration for analysis by gamma spectroscopy.						

**Table 14.** Tritium concentrations<sup>1</sup> for water monitoring samples, first quarter, 2005. Concentrations are expressed in pCi/L.

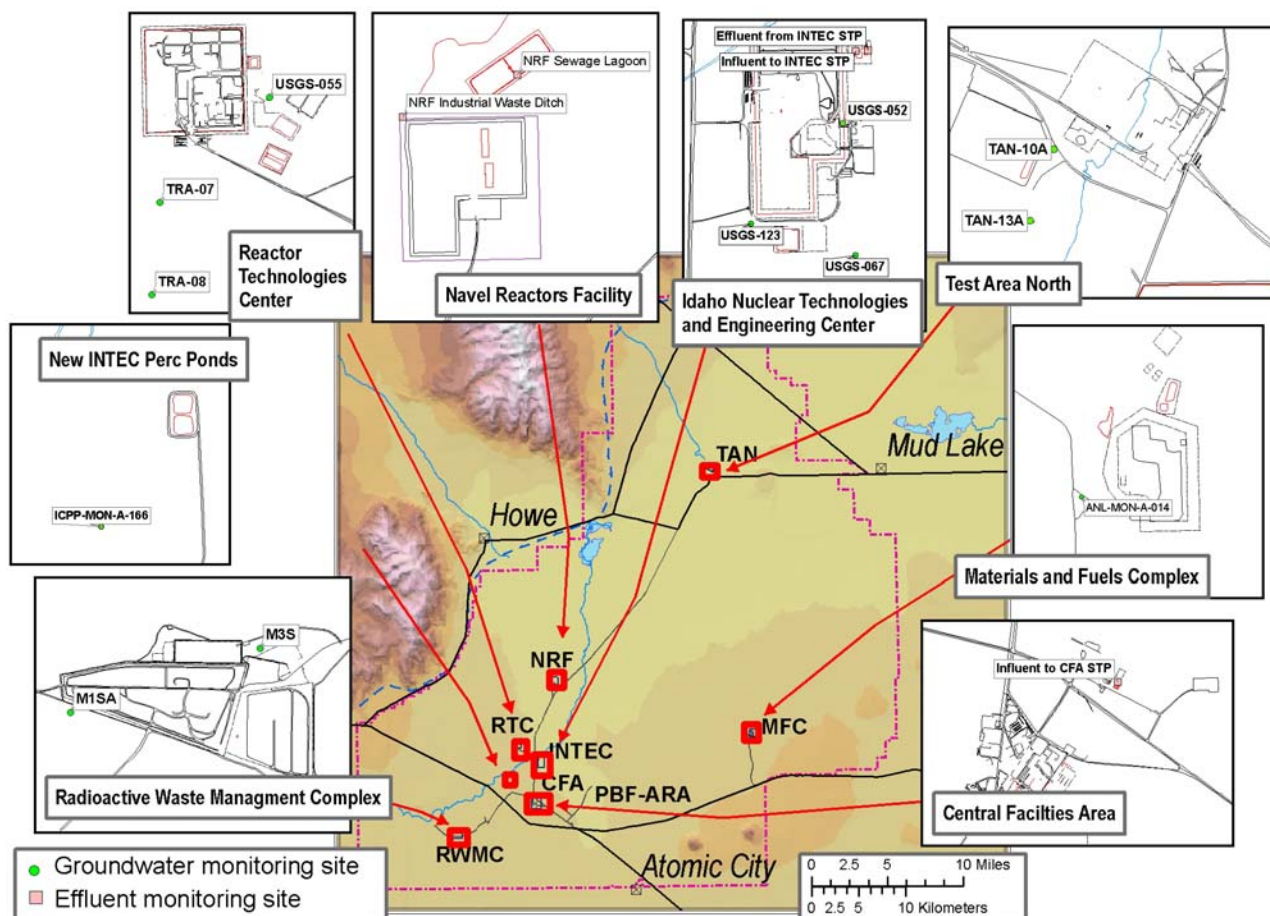
Expressed in pCi/L.

Sample Location	Sample Date	Tritium	
		Concentration	± 2 SD
<b>Onsite and Boundary</b>			
Atomic City	2/11/2005	-60 U	70
Mud Lake Water Supply	2/11/2005	-80 U	80
<b>Offsite and Distant</b>			
Alpheus Spring	2/8/2005	-60 U	70
Bill Jones Hatchery	2/8/2005	-60 U	70
Clear Springs Hatchery	2/8/2005	-60 U	70
Minidoka Water Supply	2/8/2005	-30 U	70
Shoshone Water Supply	2/8/2005	-10 U	80
<sup>1</sup> Data qualifiers: U = non-detection, J = estimate, R = rejected.			

**Table 15.** Enriched tritium concentrations<sup>1</sup> for water monitoring samples, first quarter, 2005. Concentrations are expressed in pCi/L.

Sample Location	Sample Date	Tritium	
		Concentration	± 2 SD
<b>Onsite and Boundary</b>			
Atomic City	2/11/2005	4 U	6
Mud Lake Water Supply	2/11/2005	0 U	6
<b>Offsite and Distant</b>			
Alpheus Spring	2/8/2005	25	7
Bill Jones Hatchery	2/8/2005	8 U	6
Clear Springs Hatchery	2/8/2005	9 U	7
Minidoka Water Supply	2/8/2005	2 U	6
Shoshone Water Supply	2/8/2005	17	7

<sup>1</sup> Data qualifiers: U = non-detection, J = estimate, R = rejected.



**Figure 3.** Planned water verification sampling sites for 2005. The purpose of DOE monitoring for each site is indicated in the figure key.



## Water Verification Sampling Program

Water samples were collected from selected sites to verify results attained by various DOE monitoring programs (**Figure 3**). The primary drivers for DOE monitoring conducted at each facility are divided into three basic groups: DOE monitoring conducted to support remediation activities (CERCLA), water monitoring to support wastewater land application permits (WLAP), and monitoring conducted under DOE environmental directives (surveillance). Selected sites monitored by BEA, NRF and MFC are sampled each year and a comparison of results is presented in the DEQ-INL annual report. During the first quarter of 2005, the DEQ-INL sampled three groundwater sites.

Gross alpha radioactivity was detected in two of the three groundwater locations. All three sites are near facilities in areas of known contamination. The detectable levels of alpha radioactivity ranged from  $6.5 \pm 2.7$  to  $7 \pm 3$  pCi/L, all below the alpha radioactivity MCL of 15 pCi/L. Gross beta radioactivity was detected in all three samples and ranged from  $4.4 \pm 1$  to  $136 \pm 2.9$  pCi/L. No man-made gamma-emitting radionuclides were detected this quarter. Analytical results for gross alpha, gross beta, and gamma radioactivity are presented in **Table 16**.

Strontium-90 was detected in USGS-055 at a concentration of  $56 \pm 13$  pCi/L, significantly above the 8 pCi/L MCL (**Table 17**). The concentration at USGS-055 is consistent with historical trends for this site. Technetium-99 was detected at all three locations sampled. The results are shown in **Table 18** and range from  $0.8 \pm 0.2$  to  $1.6 \pm 0.2$  pCi/L consistent with historical trends for these sites.

Tritium was detected in all three of the groundwater samples and ranged from  $4550 \pm 180$  to  $17290 \pm 350$  pCi/L (**Table 19**). The highest concentration was measured in the sample from TRA-07, an area of known contamination. All concentrations were below the MCL of 20,000 pCi/L.

Americium-241 was not detected in the first quarter sample collected from USGS-123, and plutonium isotopes were not detected in the first quarter samples from TRA-07 and USGS-123 (**Tables 20, and 21**). Isotopes of uranium were detected in samples from these sites. Uranium-234 was detected in the samples from USGS-123 ( $1.34 \pm 0.28$  pCi/L) and TRA-07 ( $2.07 \pm 0.41$  pCi/L). Uranium-235 was detected in TRA-07 ( $0.07 \pm 0.05$  pCi/L). Uranium-238 was detected in USGS-123 ( $0.69 \pm 0.17$  pCi/L) and TRA-07 ( $1.03 \pm 0.23$  pCi/L). USGS-123 is an area of known contamination, which is down gradient from the INTEC tank farms (**Table 22**). DEQ-INL sampled TRA-07 for uranium isotopes this quarter in response to gross alpha radioactivity measurements exceeding detectable levels for this site in recent sampling periods. Concentrations of uranium isotopes measured are not inconsistent with natural levels of uranium isotopes in groundwater.

Common ion results are within expected ranges and are shown in **Table 23**. Alkalinity ranged from 132 to 169 mg/L. Chloride ranged from 14.1 to 24.1 mg/L. Fluoride results ranged from 0.24 to 0.37 mg/L. Silica results ranged from 22.2 to 25.8 mg/L. Sulfate ranged from 21.8 to 160 mg/L. TDS ranged from 240 to 430 mg/L and detectable TSS ranged from 2.4 to 32 mg/L.

All measured nutrient concentrations at each monitoring site were within expected ranges (**Table 24**). Detectable results for nitrate + nitrite as nitrogen ranged from 1.07 to 1.28 mg/L. Total phosphorous ranged from 0.057 to 0.26 mg/L.

Results for metal analysis are shown in **Table 25**. All metals results were consistent with historical trends.

USGS-123 was the only location which was sampled for VOCs this quarter and there were no detectable levels found in the sample. MDC's for the sample monitored during the first quarter of 2005 are listed in Appendix D.

**Table 16.** Reported concentrations<sup>1</sup> of gross alpha, gross beta, and cesium-137 in water verification samples, first quarter, 2005. Concentrations are expressed in pCi/L. Samples were not filtered.

Samples, first quarter, 2000. Concentrations are expressed in pCi/L. Samples were not filtered.

Sample Location	Sample Date	Gross Alpha		Gross Beta		Man-made, gamma-emitting radionuclide Cesium-137	
		Concentration	± 2 SD	Concentration	± 2 SD	Concentration	± 2 SD
Groundwater							
TRA-07	3/15/2005	7.0	3.0	4.9	1.2	1.0U	1.9
USGS-055	3/15/2005	6.5	2.7	136	2.9	-0.9U	1.6
USGS-123	3/7/2005	1.6 U	1.8	4.4	1.0	-0.2U	1.6

<sup>1</sup> Data qualifiers: U = non-detection, J = estimate, R = rejected.

**Table 17.** Reported concentrations<sup>1</sup> of strontium-90 in water verification samples, first quarter, 2005. Concentrations are expressed in pCi/L. Samples were not filtered.

Concentrations are expressed in pCi/L. Samples were not filtered.

Sample Location	Sample Date	Strontium-90	
		Concentration	± 2 SD
Groundwater			
TRA-07	3/15/2005	0.26 U	0.21
USGS-123	3/7/2005	0.16 U	0.19
USGS-055	3/15/2005	56.0	13.0
<sup>1</sup> Data qualifiers: U = non-detection, J = estimate, R = rejected.			

**Table 18.** Reported concentrations<sup>1</sup> of dissolved technetium-99 in water verification samples, first quarter, 2005. Concentrations are expressed in pCi/L. Samples were filtered.

2005: Concentrations are expressed in pCi/L. Samples were filtered.			
Sample Location	Sample Date	Technetium-99	
		Concentration	± 2 SD
Groundwater			
USGS-055	3/15/2005	0.8	0.2
USGS-123	3/7/2005	1.6	0.2
1 Data qualifiers: U = non-detection, J = estimate, R = rejected.			



**Table 19.** Reported concentrations<sup>1</sup> of total tritium in water verification samples, first quarter, 2005. Concentrations are expressed in pCi/L.

Concentrations are expressed in pCi/L.

Sample Location	Sample Date	Tritium	
		Concentration	± 2 SD
Groundwater			
TRA-07	3/15/2005	17290	350
USGS-123	3/7/2005	4550	180
USGS-055	3/15/2005	5930	210
<sup>1</sup> Data qualifiers: U = non-detection, J = estimate, R = rejected.			

**Table 20.** Reported concentrations<sup>1</sup> of americium-241 in water verification samples, first quarter, 2005. Concentrations are expressed in pCi/L. Samples were not filtered.

Concentrations are expressed in pCi/L. Samples were not filtered.			
Sample Location	Sample Date	Americium-241	
		Concentration	±2 SD
Groundwater			
USGS-123	3/7/2005	0.006 U	0.029
1 Data qualifiers: U = non-detection, J = estimate, R = rejected.			

**Table 21.** Reported concentrations<sup>1</sup> of total plutonium-238, plutonium-239/240, and plutonium-241 in water verification samples, first quarter, 2005. Concentrations are expressed in pCi/L. Samples were not filtered.

Sample Location	Sample Date	Plutonium-238		Plutonium-239/240		Plutonium-241	
		Concentration	± 2 SD	Concentration	± 2 SD	Concentration	± 2 SD
Groundwater							
USGS-123	3/7/2005	0.006 U	0.023	-0.004 U	0.023	-1.6 U	4.0
TRA-07	3/15/2005	-0.005 U	0.028	0.008 U	0.028	NR	
<sup>1</sup> Data qualifiers: U = non-detection, J = estimate, R = rejected; NR = analysis not requested.							

**Table 22.** Reported concentrations<sup>1</sup> of total uranium-234, uranium-235, and uranium-238 in water verification samples, first quarter, 2005. Concentrations are expressed in pCi/L. Samples were not filtered.

Sample Location	Sample Date	Uranium-234		Uranium 235		Uranium-238	
		Concentration	± 2 SD	Concentration	± 2 SD	Concentration	± 2 SD
Groundwater							
TRA-07	3/15/2005	2.07	0.41	0.070	0.050	1.03	0.23
USGS-123	3/7/2005	1.34	0.28	0.029 U	0.036	0.69	0.17
<sup>1</sup> Data qualifiers: U = non-detection, J = estimate, R = rejected.							

**Table 23.** Reported total concentrations<sup>1</sup> of common ions for the water verification samples, first quarter, 2005. Concentrations are expressed in mg/L. Samples were not filtered.

2008. Concentrations are expressed in mg/L. Samples were not filtered.

Sample Location	Sample Date	Concentration						
		Total Alkalinity	Chloride	Flouride	Silica	Sulfate	TDS <sup>2</sup>	TSS <sup>3</sup>
Groundwater								
TRA-07		134	24.1	0.35	22.2	160	430	32
USGS-123		132	22.9	0.24	25.8	21.8	240	2.4
USGS-055		169	14.1	0.37	22.3	56.4	300	6.0
<sup>1</sup> Data qualifiers: U = non-detection, J = estimate, R = rejected. A "<" indicates a result below the Minimum Detectable Concentration.								
<sup>2</sup> Total dissolved solids.								
<sup>3</sup> Total suspended solids.								

**Table 24.** Reported total nutrient concentrations<sup>1</sup> in water verification samples, first quarter, 2005. Concentrations are expressed in mg/L. Samples were not filtered.

Concentrations are expressed in mg/L. Samples were not filtered.

Sample Location	Sample Date	Concentration				
		Ammonia (as Nitrogen)	Total Kjeldahl Nitrogen	Nitrite (as Nitrogen)	Nitrite + Nitrate (as Nitrogen)	Phosphorus
Groundwater						
TRA-07	3/15/2005	NR	NR	NR	1.28	0.057
USGS-123	3/7/2005	NR	NR	NR	1.07	0.067
USGS-055	3/15/2005	NR	NR	NR	1.24	0.26
<sup>1</sup> Data qualifiers: U = non-detection, J = estimate, R = rejected. A "<" indicates a result below the Minimum Detectable Concentration; NR = analysis not requested.						

**Table 25.** Reported metals concentrations<sup>1</sup> in water verification samples, first quarter, 2005. Samples were not filtered (total), unless otherwise noted.

Sample Location	Sample Date	Concentration											
		Calcium (mg/L)	Magnesium (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Arsenic (µg/L)	Barium (µg/L)	Beryllium (µg/L)	Cadmium (µg/L)	Chromium (µg/L)	Cobalt (µg/L)	Copper (µg/L)	Iron (µg/L)
Groundwater													
TRA-07 (dissolved)	3/15/2005	85	19	16	3.1	<5 U	82	<1 U	<1 U	118	<10	<10 U	<10 U
TRA-07 (total)	3/15/2005	88	20	16	3.5	<5 U	104	<1 U	<1 U	139	<10	<10 U	590
USGS-123 (total)	3/7/2005	41	14	13.2	2.9	<5 U	47	<1 U	<1 U	7	<10	<10 U	80
USGS-055 (dissolved)	3/15/2005	62	16	14	2.9	9	61	<1 U	<1 U	37	<10	<10 U	<10 U
USGS-055 (total)	3/15/2005	62	16	14	2.9	8	73	<1 U	<1 U	38	<10	<10 U	160
¹ Data qualifiers: U = non-detection, J = estimate, R = rejected. A "<" indicates a result below the Minimum Detectable Concentration; NR = analysis not requested.													

**Table 25 continued.** Reported metals concentrations<sup>1</sup> in verification water monitoring samples, first quarter, 2005. Samples were not filtered, unless otherwise noted.

Sample Location	Sample Date 2005	Concentration										
		Lead (µg/L)	Manganese (µg/L)	Thallium (µg/L)	Nickel (µg/L)	Silver (µg/L)	Vanadium (µg/L)	Zinc (µg/L)	Antimony (µg/L)	Aluminum (µg/L)	Selenium (µg/L)	Mercury (µg/L)
Groundwater												
TRA-07 (dissolved)	3/15/2005	<5 U	<1 U	<1 U	<10 U	<1 U	NR	<5 U	<5 U	<100 U	<10 U	<0.5 U
TRA-07 (total)	3/15/2005	<5 U	8	<1 U	<10 U	<1 U	NR	228	<5 U	600	<10 U	<0.5 U
USGS-123 (total)	3/7/2005	<5 U	3	<1 U	30	<1 U	NR	<5 U	<5 U	100	<10 U	<0.5 U
USGS-055 (dissolved)	3/15/2005	<5 U	<1 U	<1 U	<10 U	<1 U	NR	<5 U	<5 U	<100 U	<10 U	<0.5 U
USGS-055 (total)	3/15/2005	<5 U	2	<1 U	<10 U	<1 U	NR	<5 U	<5 U	200	<10 U	<0.5 U
¹ Data qualifiers: U = non-detection, J = estimate, R = rejected. A "<" indicates a result below the Minimum Detectable Concentration; NR = analysis not requested.												

## Terrestrial Monitoring Results

The ESP conducts terrestrial (soil and milk) monitoring and verification to provide an indication as to the long-term deposition and migration of contaminants in the environment, and to provide independent verification of DOE's analytical measurement of terrestrial variables.

Results for analyses of milk samples, which are collected monthly, are presented in **Table 26**. Naturally occurring potassium-40 was detected in all samples within the expected range. Iodine-131, a man-made radionuclide, was not detected.

DEQ-INL monitors long-term radiological conditions using measurement devices capable of identifying and measuring quantities of gamma-emitting radionuclides in soil. Monitoring concentrations of gamma-emitting radionuclides in surface soil provides insight to the transport, deposition, and accumulation of radioactive material in the environment as a result of INEEL operations and the historic atmospheric testing of nuclear weapons.

No soil samples were collected during the first quarter of 2005.

**Table 26.** Gamma spectroscopy analysis data for milk samples, first quarter, 2005. Concentrations are expressed in pCi/L.

Expressed in pCi/L.

Sample Location/Dairy	Sample Date	Naturally occurring gamma-emitting radionuclide Potassium-40 (pCi/L)		Man-made gamma-emitting radionuclide Iodine-131 <sup>1</sup>
		Concentration	± 2 SD	
<b>Monitoring Samples</b>				
Howe/Nelson-Ricks Creamery	1/10/05	1624	113	<MDC
	2/08/05	1603	113	<MDC
	3/10/05	1478	119	<MDC
Mud Lake/Nelson-Ricks Creamery	1/10/05	1434	119	<MDC
	2/08/05	1405	110	<MDC
	3/10/05	1666	115	<MDC
Rupert-Minidoka/Kraft	1/11/05	1560	122	<MDC
	2/08/05	1423	112	<MDC
	3/08/05	1423	112	<MDC
Gooding/Glanbia	1/11/05	1347	107	<MDC
	2/08/05	1381	113	<MDC
	3/08/05	1660	114	<MDC
<b>Verification Samples<sup>2</sup></b>				
Roberts	2/01/05	1542	123	<MDC
Minidoka	1/04/05	1509	122	<MDC
Blackfoot	3/01/05	1638	114	<MDC
Terreton	1/04/05	1495	114	<MDC
Terreton	3/01/05	141	116	<MDC
Moreland	2/01/05	1374	109	<MDC

<sup>1</sup> <MDC – Less than Minimum Detectable Concentration (approximately 4 pCi/L for Iodine-131).

<sup>2</sup> DEQ-INL samples collected by the offsite INEEL environmental surveillance contractor.

## Quality Assurance

The measurement of any physical quantity is subject to uncertainty from errors that may be introduced during sample collection, measurement, calibration, and the reading and reporting of results. While the sum of these inaccuracies cannot be quantified for each analytical result, a quality assurance program can evaluate the overall quality of a data set and possibly identify and address errors or inaccuracies.

This section summarizes the results of the quality assurance (QA) assessment of the data collected for the first quarter of 2005 for the DEQ-INL's ESP. It also summarizes the quality control (QC) samples (spikes, blanks, and duplicates) submitted to the Idaho Bureau of Laboratories-Boise (IBL) for

nonradiological analyses and to Idaho State University's Environmental Monitoring Laboratory (ISU-EML) for radiological analyses during the quarter. All analyses and QC measures at the analytical laboratories used by the ESP are performed in accordance with approved written procedures maintained by each respective analytical laboratory. Sample collection is performed in accordance with written procedures maintained by the DEQ-INL.

Analytical results for blanks, duplicates, and spikes are used to assess the precision, accuracy, and representativeness of results from analyzing laboratories. During the first quarter of 2005, the DEQ-INL submitted 53 QC samples for various radiological and nonradiological analyses (**Table 27**).

## **Blank Samples**

Blank samples consist of matrices that have negligible, acceptably low, or unmeasurable amounts of the analyte(s) of interest in them. They are designed to determine if analyses will provide a "zero" result when no contaminant is expected to be present or an acceptable measure of "background," and therefore monitor any bias that may have been introduced during sample collection, storage, shipment, and analysis. Blank sample results submitted for gross alpha and gross beta screening in air for the first quarter of 2005 are presented in **Table 28**. Blank sample results for select gamma emitters in air from composited air filters are presented in **Table 29**. Blank analysis results for strontium-90, plutonium 238, plutonium 239/240 and americium 241 are presented in **Table 31**. Data for blank analyses used to assess data quality for tritium in water vapor in air are presented in **Table 31**. Blank analyses results for cesium-137, potassium-40, tritium, enriched tritium, gross alpha, and gross beta in ground and surface water media are presented in **Table 32**.

No anomalies were observed from the assessment of field blank samples as measured by the analytical laboratories used by DEQ-INL for the first quarter of 2005.

## **Duplicate Samples**

Duplicate samples are collected in a manner such that the samples are thought to be essentially identical in composition and are used to assess analytical precision. The difference between the original sample and the duplicate sample is expressed as a relative percent difference (RPD) and is used to measure a laboratory's ability to reproduce consistent results. For radiological analyses, the standard deviation of the differences can be used as an indicator of the overall precision of the data set. Duplicate results for ground and surface water are presented in **Table 33** for radiological analyses.

No anomalies were observed from the assessment of field duplicate samples as measured by the analytical laboratories used by DEQ-INL for the first quarter of 2005.

## **Spiked Samples**

Spiked samples are samples to which known concentrations of specific analytes have been added in order to assess the bias a laboratory may have in accurately measuring these analytes. To determine agreement after laboratory analysis, DEQ-INL calculates the difference between the known concentration in the sample and the measured concentration by the laboratory. This result is known as percent recovery (%R) and the acceptable range used by DEQ-INL is  $100 \pm 25$  percent. During first quarter 2005, no field matrices were spiked to assess the influence of the sample media on laboratory performance.

DEQ-INL also prepares additional “spike-like” quality control samples to assess ambient radiation measurement bias. Once per quarter, DEQ-INL irradiates a number of electret ionization chambers (EIC) to verify EIC response. Irradiations of EICs are conducted in a repeatable geometry to a known exposure of 30 mR and a “blind” exposure ranging from 20 to 50 mR. EIC responses are compared directly with the exposure received from the NIST traceable cesium-137 source provided by ISU-EML. EIC response is considered acceptable if each measurement agrees within 25 percent of the known irradiated quantity. The irradiation results for first quarter 2005 are presented in **Table 34**. Four EIC spike measurements failed the recovery criterion of  $100 \pm 25$  percent. However, because of the nature of the errors discovered this quarter and the fact that the field data appear to be consistent with historical trends, EIC field data collected for this quarter are qualified only as estimates (J). The specific causes for these anomalies are currently under investigation but may relate to errors in the irradiation process or problems exhibited with the reading of these devices.

No additional anomalies from those outlined above were observed from the assessment of spiked samples as measured by DEQ-INL or the analytical laboratories used by DEQ-INL for the first quarter of 2005.

### **Analytical QA/QC Assessment**

No issues involving sample chain of custody, sample holding times, the analysis of blank, and duplicate samples were observed during the first quarter of 2005 which significantly affected data quality. Sample spikes used to assess EIC performance were measured out of specification but did not cause data results to be rejected. Methodologies and data reports issued by the contracting laboratories generally conformed to the requirements of DEQ-INL during the first quarter of 2005.

Data usability is the measure of data that is not rejected compared to the amount that was expected to be obtained. The overall data usability rate for the first quarter of 2005 met the criteria of the DEQ-INL ESP and is summarized in **Table 27**.

### **Preventative Maintenance and Equipment Reliability**

All equipment was calibrated and checked according to pre-described periodicity. Service reliability for air sampling equipment for the first quarter of 2005 is summarized in **Table 35**. Air sampling equipment requiring repair included:

- PM<sub>10</sub> sampler pump at the Atomic City monitoring station (pump not replaced, low-volume air sampler installed at this location and is being used to sample both radioiodine and tritium).

### **Conclusion**

All data collected for the first quarter of 2005 have been assigned the applicable qualifiers to designate the appropriate use of the data. In addition, all data has been verified and deemed complete, meeting the requirements and data quality objectives established by DEQ-INL.

**Table 27.** Summary of the analytical performance and usability of the analyses performed for the DEQ-INL ESP for first quarter, 2005.

Media Sampled	Collection Device	Analyte	Test Analyses	Blank Analyses	Duplicate Analyses	Spike Analyses	Data Rejected <sup>1</sup>	Analyzing Lab <sup>2</sup>
AIR								
Particulate <small>(Does not include PM<sub>10</sub> measurements)</small>	4 inch filter	Gross alpha	141	13	0	0	0	ISU-EML
		Gross beta	141	13	0	0	0	ISU-EML
		Gamma emitters	11	1	0	0	0	ISU-EML
		Radiochemical	13	1	0	0	0	ISU Sub
Particulate	Desiccant column	Tritium	22	3	0	0	0	ISU-EML
Gaseous	Charcoal filter	Iodine-131	13	0	0	0	0	ISU-EML
Precipitation	Poly bottle	Tritium	6	0	0	0	0	ISU-EML
		Gamma emitters	6	0	0	0	0	ISU-EML
WATER								
Groundwater & Surface Water	Grab or composite	Gross alpha	10	1	1	0	0	ISU-EML
		Gross beta	10	1	1	0	0	ISU-EML
		Gamma emitters	10	1	1	0	0	ISU-EML
		Tritium	10	1	1	0	0	ISU-EML
		Enriched tritium	7	1	1	0	0	ISU-EML
		Technetium-99	1	0	0	0	0	ISU-EML
		Radiochemical	3	0	0	0	0	ISU Sub
		Metals	5	0	0	0	0	IBL
		Common Ions	3	0	0	0	0	IBL
		Nutrients	3	0	0	0	0	IBL
Volatile Organics	1	0	0	0	0	IBL Sub		
TERRESTRIAL								
Milk	Grab or composite	Gamma emitters	18	0	0	0	0	ISU-EML
Soil	<i>in situ</i>	Gamma emitters	0	0	0	0	0	DEQ-INL
	Grab – “puck”	Gamma emitters	0	0	0	0	0	ISU-EML
RADIATION								
Ambient	EICs <sup>3</sup>	Gamma Radiation	96	4	0	8	0	DEQ-INL
	HPICs	Gamma Radiation	NA	NA	NA	NA	NA	DEQ-INL
Total Analyses			530	40	5	8	0	
Total of QC Analyses (blanks, duplicates, and spikes)						53		
Percentage of QC analyses of total analyses <sup>4</sup>						10.0		
Percentage of usable data <sup>5</sup>						100		
<sup>1</sup> Combined Laboratory and DEQ-INL rejection criteria (data was rejected for any reason).								
<sup>2</sup> ISU-EML = Idaho State University – Environmental Monitoring Laboratory; ISU Sub = Subcontract laboratory to ISU-EML; IBL = Idaho Bureau of Laboratories, Boise; IBL Sub = Subcontract laboratory to IBL; DEQ-INL = Analyzed by INL Oversight and Radiation Control, Idaho Department of Environmental Quality.								
<sup>3</sup> Because of adverse weather conditions, 3 samples were collected during the beginning of the first quarter of 2005 instead of the 4 <sup>th</sup> quarter of 2004. These samples were added to this quarter's total.								
<sup>4</sup> Analyzing quality control samples at a rate of approximately 5 to 10 percent of the total number of analyses performed for the year is deemed appropriate for the DEQ-INL ESP.								
<sup>5</sup> Data usability rate [total analyses – rejected data]/[total analyses] of 90 percent or higher is acceptable for the DEQ-INL ESP.								



**Table 28.** Blank analysis results for gross alpha and beta in particulate air (TSP) for the first quarter, 2005. Concentrations<sup>1</sup> and associated uncertainties (2 SD) are expressed in  $1 \times 10^{-3}$  pCi/m<sup>3</sup>.

Collection Period		Corrected volume (m <sup>3</sup> ) <sup>1</sup>	Gross alpha		Gross beta	
Start	Stop		Value	Uncertainty (± 2 SD)	Value	Uncertainty (± 2 SD)
12/30/04	01/06/05	1752	0.2	0.2	-0.3	0.3
01/06/05	01/13/05	1752	0.2	0.2	-0.7	0.3
01/13/05	01/20/05	1752	-0.2	0.2	0.1	0.3
01/20/05	01/27/05	1752	0.0	0.2	0.0	0.3
01/27/05	02/03/05	1752	0.0	0.2	0.0	0.3
02/03/05	02/10/05	1752	0.7	0.2	0.4	0.3
02/10/05	02/17/05	1752	-0.3	0.2	-0.1	0.3
02/17/05	02/24/05	1752	0.0	0.2	-0.3	0.3
02/24/05	03/03/05	1752	0.1	0.2	0.4	0.3
03/03/05	03/10/05	1752	-0.2	0.2	-0.5	0.3
03/10/05	03/17/05	1752	0.0	0.2	-0.3	0.3
03/17/05	03/24/05	1752	0.1	0.2	-0.3	0.3
03/24/05	03/31/05	1752	-0.2	0.2	-0.4	0.3

<sup>1</sup> A volume equal to the average of the volumes collected through each valid field filter was used to compute "concentrations" for the blank for meaningful comparison to sample results. No air was passed through the blank filters.

**Table 29.** Blank analysis results for gamma spectroscopy for TSP particulate air filters for the first quarter, 2005. Concentrations<sup>1</sup> are expressed in  $1 \times 10^{-5}$  pCi/m<sup>3</sup> with associated uncertainty (± 2 SD) and minimum detectable concentration (MDC).

Analysis Date	Beryllium-7			Ruthenium-106/ Rhodium-106			Antimony-125		
	Concentration	± 2 SD	MDC	Concentration	± 2 SD	MDC	Concentration	± 2 SD	MDC
04/23/05	11	55	91	23	45	75	-4	11	18

<sup>1</sup> These concentrations are from blank filters collected weekly, composited, and analyzed for the calendar quarter. A volume equal to the average of the volumes collected through each valid field filter was used to compute "concentrations" for the blank for meaningful comparison to sample results. No air was passed through the blank filters. NR = analysis not requested.

**Table 29 continued.** Blank analysis results for gamma spectroscopy for TSP particulate air filters for the first quarter, 2005. Concentrations<sup>1</sup> are expressed in  $1 \times 10^{-5}$  pCi/m<sup>3</sup> with associated uncertainty (± 2 SD) and minimum detectable concentration (MDC).

Analysis Date	Cesium-134			Cesium-137		
	Concentration	± 2 SD	MDC	Concentration	± 2 SD	MDC
04/23/05	1	4	6	-3	4	7

<sup>1</sup> These concentrations are from blank filters collected weekly, composited, and analyzed for the calendar quarter. A volume equal to the average of the volumes collected through each valid field filter was used to compute "concentrations" for the blank for meaningful comparison to sample results. No air was passed through the blank filters. NR = analysis not requested.

**Table 30.** Blank analysis results for radiochemical analysis data for TSP particulate air filters composited for 2004. Concentrations<sup>1</sup> are expressed in  $1 \times 10^{-5}$  pCi/m<sup>3</sup> with associated uncertainty ( $\pm 2$  SD) and minimum detectable concentration (MDC).

Analysis Date	Strontium-90			Plutonium-238		
	Concentration	$\pm 2$ SD	MDC	Concentration	$\pm 2$ SD	MDC
04/05	0.45	1.19	2.10	-0.02	0.04	0.18
<sup>1</sup> These concentrations are from blank filters collected weekly, composited, and analyzed for the calendar quarter. A volume equal to the average of the volumes collected through each valid field filter was used to compute "concentrations" for the blank for meaningful comparison to sample results. No air was passed through the blank filters. NR = analysis not requested.						

**Table 30 continued.** Blank analysis results for radiochemical analysis data for TSP particulate air filters composited for 2004. Concentrations<sup>1</sup> are expressed in  $1 \times 10^{-5}$  pCi/m<sup>3</sup> with associated uncertainty ( $\pm 2$  SD) and minimum detectable concentration (MDC).

Analysis Date	Plutonium-239/240			Americium-241		
	Concentration	$\pm 2$ SD	MDC	Concentration	$\pm 2$ SD	MDC
04/05	-0.01	0.02	0.09	0.03	0.07	0.09
<sup>1</sup> These concentrations are from blank filters collected weekly, composited, and analyzed for the calendar quarter. A volume equal to the average of the volumes collected through each valid field filter was used to compute "concentrations" for the blank for meaningful comparison to sample results. No air was passed through the blank filters. NR = analysis not requested.						

**Table 31.** Blank analysis results for tritium water vapor from air samples for the first quarter, 2005. Concentrations are expressed in pCi/L with associated uncertainty ( $\pm 2$  SD) and minimum detectable concentration (MDC).

Sample Number	Start Date	Collect Date	Analysis Date	Tritium		
				Concentration	$\pm 2$ SD	MDC
OP051ZTR01	04/20/05	04/20/05	04/26/05	-0.05	0.07	0.12
OP051ZTR02	04/20/05	04/20/05	04/26/05	-0.04	0.07	0.12
OP051ZTR03	01/14/05	04/20/05	04/26/05	-0.02	0.07	0.12

**Table 32.** Blank analysis results for cesium-137, potassium-40, tritium, enriched tritium, gross alpha, and gross beta in ground and surface water samples for the first quarter, 2005. Concentrations are expressed in pCi/L with associated uncertainty ( $\pm 2$  SD) and minimum detectable concentration (MDC).

Sample Number	Cesium-137			Potassium-40			Tritium			Enriched Tritium			Gross Alpha			Gross Beta		
	Concentration	$\pm 2$ SD	MDC	Concentration	$\pm 2$ SD	MDC	Concentration	$\pm 2$ SD	MDC	Concentration	$\pm 2$ SD	MDC	Concentration	$\pm 2$ SD	MDC	Concentration	$\pm 2$ SD	MDC
051W017	0.9	1.5	2.4	58	45	73	NR <sup>1</sup>	-	-	NR <sup>1</sup>	-	-	-0.5	0.6	1.2	0.1	0.8	1.3
051W018	NR <sup>1</sup>	-	-	NR <sup>1</sup>	-	-	-10	80	130	31	7	9	NR <sup>1</sup>	-	-	NR <sup>1</sup>	-	-

<sup>1</sup> NR = analysis not requested.

**Table 33.** Duplicate radiological analysis results (in pCi/L) for ground and surface water, first quarter, 2005.

Analysis/ Sample Location	Original Sample Number	Analysis Date	Concentration	$\pm 2$ SD	Duplicate Sample Number	Analysis Date	Concentration	$\pm 2$ SD	$ R_1 - R_2 $	$3(s_1^2 + s_2^2)^{1/2}$	Within Criteria? <sup>1</sup>
<b>Gross Alpha</b>											
Atomic City	051W003	03/18/05	-0.1	1.9	051W015	03/25/2005	0.1	1.9	0.2	8.1	Yes
<b>Gross Beta</b>											
Atomic City	051W003	03/18/05	1.8	0.9	051W015	03/25/2005	2.2	1.0	0.4	4.0	Yes
<b>Gamma Spectroscopy Cesium-137</b>											
Atomic City	051W003	02/25/05	0.6	1.4	051W015	03/7/2005	-0.1	1.5	0.7	6.2	Yes
<b>Gamma Spectroscopy Potassium-40</b>											
Atomic City	051W003	02/25/05	-8	42	051W015	03/7/2005	-11	55	3.0	207.6	Yes
<b>Tritium</b>											
Atomic City	051W004	03/11/05	-60	70	051W016	03/11/2005	70	80	130	318.9	Yes
<b>Enriched Tritium</b>											
Atomic City	051W004	04/18/05	4	6	051W016	04/18/2005	11	7	7.0	27.7	Yes

<sup>1</sup>  $|R_1 - R_2| \leq 3(s_1^2 + s_2^2)^{1/2}$

**Table 34.** Electret ionization chamber irradiation results (categorized as spiked samples) for first quarter, 2005. A percent recovery (%R) of  $100 \pm 25$  is considered acceptable.

Electret #	Exposure Received		Gross Measured Exposure		Background <sup>1</sup>		Net Exposure <sup>2</sup>		%R
	(mR)	Uncertainty (mR)	(mR)	Uncertainty (mR)	(mR)	Uncertainty (mR)	(mR)	Uncertainty <sup>3</sup> (mR)	
S1	29.9	1.50	38.9	1.24	1.0	0.66	37.9	1.41	127
S2	29.9	1.50	37.3	1.29	1.0	0.66	36.3	1.45	122
S3	29.9	1.50	39.0	1.26	1.0	0.66	38.0	1.42	127
S4	29.9	1.50	36.9	1.33	1.0	0.66	35.9	1.48	120
S5	21.1	1.06	41.8	1.26	1.0	0.66	40.8	1.42	193
S6	21.1	1.06	8.1	1.26	1.0	0.66	7.1	1.42	34
S7	21.1	1.06	26.4	1.31	1.0	0.66	25.4	1.47	120
S8	21.1	1.06	26.8	1.23	1.0	0.66	25.8	1.40	122

<sup>1</sup> Four EICs were used for control measurements (counted as blanks) and were not irradiated. Background exposure, as measured by the control group, was  $1.0 \pm 0.66$  mR.  
<sup>2</sup> [Gross Measured Exposure] – [Background].  
<sup>3</sup> Total propagated error.

**Table 35.** Air sampling field equipment service reliability (percent operational) for first quarter 2005. These values were calculated by dividing the number of weeks the equipment was in operation by the number of weeks in the quarter.

Station Locations	Sample Type <sup>1</sup>				
	PM <sub>10</sub>	TSP	Radioiodine	Atmospheric Moisture	Precipitation
<b>Onsite Locations</b>					
Big Lost River Rest Area	NC	100%	100%	100%	100%
Experimental Field Station	NC	100%	100%	100%	NC
Sand Dunes Tower	NC	100%	100%	100%	NC
Van Buren Avenue	NC	100%	100%	100%	NC
<b>Boundary Locations</b>					
Atomic City	87.5% <sup>2</sup>	100%	92%	100%	100%
Howe	NC	100%	100%	100%	100%
Montevue	NC	100%	100%	100%	100%
Mud Lake	100%	100%	CP	100%	100%
<b>Distant Locations</b>					
Craters of the Moon	NC	100%	100%	100%	NC
Fort Hall <sup>3</sup>	NC	100%	100%	100%	NC
Idaho Falls	NC	100%	100%	100%	100%
<sup>1</sup> NC = sample not collected at this location; CP = sample collected using the PM <sub>10</sub> sampler at this location. <sup>2</sup> PM <sub>10</sub> sampling at Atomic City was discontinued during this quarter. <sup>3</sup> Operated by Shoshone-Bannock Tribes.					

## Appendix A

**Table A-1.** Weekly concentrations (in  $1 \times 10^{-3}$  pCi/m<sup>3</sup>) for gross alpha and gross beta analyses for TSP filters for all locations, first quarter, 2005.

Sample Location	Collection Date		Gross Alpha		Gross Beta	
	Start	Stop	Concentration	± 2 SD	Concentration	± 2 SD
Big Lost River Rest Area	12/30/04	01/06/05	0.3	0.2	24.0	1.1
	01/06/05	01/13/05	0.5	0.3	23.2	1.1
	01/13/05	01/20/05	0.9	0.3	43.6	1.5
	01/20/05	01/27/05	0.8	0.3	43.5	1.5
	01/27/05	02/03/05	1.4	0.4	52.6	2.0
	02/03/05	02/10/05	0.6	0.2	39.5	1.4
	02/10/05	02/17/05	0.5	0.3	26.2	1.2
	02/17/05	02/24/05	0.9	0.3	33.6	1.3
	02/24/05	03/03/05	0.6	0.3	45.9	1.5
	03/03/05	03/10/05	0.9	0.3	38.1	1.4
	03/10/05	03/17/05	0.6	0.2	16.9	0.9
	03/17/05	03/24/05	0.5	0.2	13.2	0.9
	03/24/05	03/31/05	0.1	0.2	14.3	0.9
Experimental Field Station	12/30/04	01/06/05	0.7	0.3	26.6	1.4
	01/06/05	01/13/05	0.5	0.3	22.9	1.1
	01/13/05	01/20/05	0.9	0.3	51.2	1.6
	01/20/05	01/27/05	1.3	0.3	64.3	1.8
	01/27/05	02/03/05	1.1	0.3	47.6	1.5
	02/03/05	02/10/05	1.1	0.3	53.2	1.6
	02/10/05	02/17/05	0.5	0.3	31.8	1.3
	02/17/05	02/24/05	0.6	0.3	36.7	1.3
	02/24/05	03/03/05	1.0	0.3	52.5	1.6
	03/03/05	03/10/05	0.6	0.3	41.1	1.4
	03/10/05	03/17/05	0.8	0.3	21.7	1.1
	03/17/05	03/24/05	0.6	0.2	11.4	0.8
	03/24/05	03/31/05	0.2	0.2	15.4	0.9

**Table A-1 continued.** Weekly concentrations (in  $1 \times 10^{-3}$  pCi/m<sup>3</sup>) for gross alpha and gross beta analyses for TSP filters for all locations, first quarter, 2005.

Sample Location	Collection Date		Gross Alpha		Gross Beta	
	Start	Stop	Concentration	± 2 SD	Concentration	± 2 SD
Sand Dunes Tower	12/30/04	01/06/05	0.5	0.2	26.2	1.3
	01/06/05	01/13/05	0.3	0.2	24.4	1.0
	01/13/05	01/20/05	1.3	0.3	51.3	1.5
	01/20/05	01/27/05	1.0	0.3	74.1	1.8
	01/27/05	02/03/05	1.1	0.3	52.9	1.5
	02/03/05	02/10/05	1.0	0.3	55.2	1.5
	02/10/05	02/17/05	0.5	0.2	30.7	1.2
	02/17/05	02/24/05	0.5	0.2	35.1	1.2
	02/24/05	03/03/05	1.0	0.3	51.5	1.5
	03/03/05	03/10/05	0.7	0.3	37.6	1.3
	03/10/05	03/17/05	0.7	0.2	21.0	1.0
	03/17/05	03/24/05	0.6	0.2	13.6	0.8
	03/24/05	03/31/05	0.2	0.2	13.1	0.8
Van Buren Avenue	12/30/04	01/06/05	0.5	0.2	25.7	1.2
	01/06/05	01/13/05	0.7	0.3	24.2	1.1
	01/13/05	01/20/05	0.6	0.3	45.8	1.5
	01/20/05	01/27/05	1.2	0.3	54.5	1.7
	01/27/05	02/03/05	1.2	0.3	52.2	1.6
	02/03/05	02/10/05	1.0	0.3	43.4	1.5
	02/10/05	02/17/05	0.5	0.3	31.2	1.3
	02/17/05	02/24/05	0.6	0.3	38.1	1.4
	02/24/05	03/03/05	1.1	0.3	50.5	1.6
	03/03/05	03/10/05	0.7	0.3	42.4	1.5
	03/10/05	03/17/05	1.3	0.4	22.7	1.4
	03/17/05	03/24/05	0.5	0.2	12.0	0.8
	03/24/05	03/31/05	0.4	0.3	13.2	0.9
Atomic City	12/30/04	01/06/05	0.4	0.2	27.7	1.2
	01/06/05	01/13/05	0.2	0.2	20.4	1.1
	01/13/05	01/20/05	0.7	0.3	52.3	1.6
	01/20/05	01/27/05	0.9	0.3	62.7	1.8
	01/27/05	02/03/05	0.9	0.3	50.4	1.6
	02/03/05	02/10/05	0.7	0.3	50.8	1.6
	02/10/05	02/17/05	0.7	0.3	36.6	1.4
	02/17/05	02/24/05	0.8	0.3	36.3	1.4
	02/24/05	03/03/05	1.5	0.3	60.1	1.8
	03/03/05	03/10/05	0.5	0.3	46.2	1.6
	03/10/05	03/17/05	0.7	0.3	23.5	1.1
	03/17/05	03/24/05	0.6	0.3	16.1	1.2
	03/24/05	03/31/05	0.1	0.2	16.6	1.0

**Table A-1 continued.** Weekly concentrations (in  $1 \times 10^{-3}$  pCi/m<sup>3</sup>) for gross alpha and gross beta analyses for TSP filters for all locations, first quarter, 2005.

Sample Location	Collection Date		Gross Alpha		Gross Beta	
	Start	Stop	Concentration	± 2 SD	Concentration	± 2 SD
Howe	12/30/04	01/06/05	0.4	0.2	26.2	1.2
	01/06/05	01/13/05	0.3	0.2	20.6	1.0
	01/13/05	01/20/05	0.8	0.3	32.6	1.3
	01/20/05	01/27/05	0.8	0.3	47.2	1.5
	01/27/05	02/03/05	1.4	0.3	46.8	1.5
	02/03/05	02/10/05	0.7	0.3	39.8	1.4
	02/10/05	02/17/05	0.4	0.3	24.0	1.1
	02/17/05	02/24/05	0.6	0.3	30.3	1.2
	02/24/05	03/03/05	0.5	0.3	42.8	1.5
	03/03/05	03/10/05	0.9	0.3	41.1	1.5
	03/10/05	03/17/05	0.6	0.2	20.8	1.1
	03/17/05	03/24/05	0.7	0.2	13.8	0.9
	03/24/05	03/31/05	0.4	0.3	13.9	0.9
Montevieu	12/30/04	01/06/05	0.4	0.2	28.8	1.2
	01/06/05	01/13/05	0.4	0.2	22.5	1.0
	01/13/05	01/20/05	1.0	0.4	60.5	2.0
	01/20/05	01/27/05	1.6	0.3	78.0	1.9
	01/27/05	02/03/05	1.3	0.3	51.1	1.5
	02/03/05	02/10/05	1.1	0.3	42.7	1.4
	02/10/05	02/17/05	0.5	0.3	25.0	1.1
	02/17/05	02/24/05	0.6	0.2	31.2	1.2
	02/24/05	03/03/05	1.1	0.3	42.6	1.4
	03/03/05	03/10/05	0.9	0.3	36.4	1.3
	03/10/05	03/17/05	0.7	0.2	18.5	1.0
	03/17/05	03/24/05	0.5	0.2	15.2	0.9
	03/24/05	03/31/05	0.3	0.2	15.4	0.9
Mud Lake	12/30/04	01/06/05	0.4	0.2	27.5	1.1
	01/06/05	01/13/05	0.5	0.2	22.1	1.0
	01/13/05	01/20/05	1.1	0.3	44.7	1.4
	01/20/05	01/27/05	1.3	0.3	74.1	1.8
	01/27/05	02/03/05	1.2	0.3	48.9	1.5
	02/03/05	02/10/05	1.1	0.3	49.9	1.5
	02/10/05	02/17/05	0.8	0.3	29.0	1.2
	02/17/05	02/24/05	0.7	0.2	35.0	1.3
	02/24/05	03/03/05	1.2	0.3	49.1	1.5
	03/03/05	03/10/05	1.1	0.3	40.2	1.4
	03/10/05	03/17/05	0.6	0.2	17.6	0.9
	03/17/05	03/24/05	0.6	0.2	13.1	0.8
	03/24/05	03/31/05	0.4	0.2	13.5	0.8



**Table A-1 continued.** Weekly concentrations (in  $1 \times 10^{-3}$  pCi/m<sup>3</sup>) for gross alpha and gross beta analyses for TSP filters for all locations, first quarter, 2005.

Sample Location	Collection Date		Gross Alpha		Gross Beta	
	Start	Stop	Concentration	± 2 SD	Concentration	± 2 SD
<b>Distant Locations</b>						
Craters of the Moon	12/30/04	01/06/05	0.4	0.2	18.9	1.0
	01/06/05	01/13/05	0.1	0.2	15.2	0.9
	01/13/05	01/20/05	0.8	0.3	28.6	1.2
	01/20/05	01/27/05	0.7	0.3	35.8	1.4
	01/27/05	02/03/05	0.8	0.3	32.3	1.3
	02/03/05	02/10/05	0.7	0.3	30.5	1.3
	02/10/05	02/17/05	0.4	0.3	20.1	1.1
	02/17/05	02/24/05	0.8	0.4	22.8	1.4
	02/24/05	03/03/05	0.7	0.3	38.9	1.4
	03/03/05	03/10/05	0.4	0.3	30.2	1.3
	03/10/05	03/17/05	0.8	0.3	17.3	1.0
	03/17/05	03/24/05	0.5	0.2	10.5	0.8
	03/24/05	03/31/05	0.2	0.3	11.0	0.8
Fort Hall <sup>1</sup>	12/30/04	01/06/05	0.5	0.2	20.9	1.0
	01/06/05	01/13/05	0.2	0.2	15.3	0.9
	01/13/05	01/20/05	1.0	0.3	36.9	1.3
	01/20/05	01/27/05	1.9	0.3	49.3	1.5
	01/27/05	02/03/05	1.4	0.3	33.7	1.3
	02/03/05	02/10/05	2.0	0.3	26.9	1.2
	02/10/05	02/17/05	1.3	0.3	23.1	1.1
	02/17/05	02/24/05	1.5	0.3	18.9	1.0
	02/24/05	03/03/05	2.0	0.4	31.4	1.5
	03/03/05	03/10/05	1.4	0.3	25.7	1.1
	03/10/05	03/17/05	<sup>2</sup>		<sup>2</sup>	
	03/17/05	03/24/05	<sup>2</sup>		<sup>2</sup>	
	03/24/05	03/31/05	0.6	0.3	14.9	0.9
Idaho Falls	12/30/04	01/06/05	0.5	0.2	27.2	1.2
	01/06/05	01/13/05	0.3	0.2	19.2	1.0
	01/13/05	01/20/05	0.7	0.3	44.4	1.4
	01/20/05	01/27/05	1.5	0.3	61.5	1.7
	01/27/05	02/03/05	1.2	0.3	47.7	1.5
	02/03/05	02/10/05	1.0	0.3	39.3	1.4
	02/10/05	02/17/05	0.7	0.3	26.3	1.4
	02/17/05	02/24/05	0.4	0.2	26.0	1.1
	02/24/05	03/03/05	1.2	0.3	44.0	1.5
	03/03/05	03/10/05	0.6	0.3	35.8	1.3
	03/10/05	03/17/05	0.9	0.3	18.5	1.0
	03/17/05	03/24/05	0.8	0.2	13.4	0.9
	03/24/05	03/31/05	0.4	0.2	12.4	0.8

<sup>1</sup> Operated by Shoshone-Bannock Tribes.

<sup>2</sup> No sample due to equipment failure.

## Appendix B

**Table B-1.** Weekly concentrations (in  $1 \times 10^{-3}$  pCi/m<sup>3</sup>) for gross alpha and gross beta analyses for PM<sub>10</sub> air samples for all locations, first quarter, 2005.

Sample Location	Collection Date		Gross Alpha		Gross Beta	
	Start	Stop	Concentration	± 2 SD	Concentration	± 2 SD
Atomic City	12/30/04	01/06/05	0.7	0.3	25.7	1.4
	01/06/05	01/13/05	0.1	0.4	24.5	1.7
	01/13/05	01/20/05	0.8	0.4	54.0	2.0
	01/20/05	01/27/05	0.8	0.4	67.5	2.2
	01/27/05	02/03/05	1.3	0.4	56.8	2.0
	02/03/05	02/10/05	0.8	0.4	53.0	2.0
	02/10/05	02/17/05	0.7	0.4	35.5	1.7
	02/17/05	02/24/05	0.4	0.4	35.5	1.8
Mud Lake	12/30/04	01/06/05	0.5	0.3	26.8	1.5
	01/06/05	01/13/05	-0.1	0.3	25.9	1.4
	01/13/05	01/20/05	0.9	0.4	61.8	2.1
	01/20/05	01/27/05	1.4	0.4	86.9	2.5
	01/27/05	02/03/05	1.4	0.4	59.7	2.1
	02/03/05	02/10/05	1.0	0.4	60.7	2.1
	02/10/05	02/17/05	0.6	0.4	37.0	1.7
	02/17/05	02/24/05	0.6	0.4	43.2	1.8
	02/24/05	03/03/05	1.4	0.4	60.2	2.1
	03/03/05	03/10/05	0.5	0.4	52.4	2.0
	03/10/05	03/17/05	1.0	0.4	21.4	1.3
	03/17/05	03/24/05	0.4	0.3	12.9	1.1
	03/24/05	03/31/05	0.3	0.4	15.6	1.2

<sup>1</sup> Sampler operation discontinued permanently on 02/24/05.

## Appendix C

**Table C-1.** Results<sup>1</sup> for additional electret locations, first quarter, 2005.

Sample Location	Net Corrected Exposure (uR/h)	± 2 SD (uR/h)
Dubois	16.9 J	1.8
Hamer	20.35 J	1.9
Sugar City	20.9 J	1.9
Blue Dome	15.77 J	1.7
TAN	20.6 J	1.9
ICPP I	23.1 J	2.0
NRF	19.7 J	1.9
EBR II	18.6 J	1.8
TRA	20.7 J	1.9
Grid 3	19.6 J	1.9
PBF	20.7 J	1.9
CFA	18.1 J	1.8
RWMC	18.4 J	1.8
Roberts	19.2 J	1.9
Kettle Butte	16.8 J	1.6
Blackfoot	18.5 J	2.4
Taber	19.4 J	2.0
Aberdeen	17.8 J	2.1
Minidoka	16.1 J	2.1
Arco	21.2 J	2.0
Richfield	16.5 J	2.1
EBR I	18.0 J	1.8
Reno Ranch	17.7 J	1.8
Rover Rd. 2.9mi	16.4 J	1.6
Rover Rd. 4.9mi	18.5 J	1.7
Rover Rd. 6.3mi	18.5 J	1.7
Rover Rd. 6.8mi	19.4 J	1.7
Rover Rd. 8.8mi	19.1 J	1.7
Rover Rd. 10.8mi	18.7 J	1.7
Rover Rd. 15.4mi	19.3 J	1.7
Rover Rd. 17.4mi	21.6 J	1.8
MP1 - 22/33	18.3 J	2.2
MP3 - 22/33	16.3 J	1.7
MP5 - 22/33	15.7 J	1.7
MP7 - 22/33	15.8 J	1.7

<sup>1</sup> Data qualifiers: U = non-detection, J = estimate, R = rejected.

**Table C-1 continued.** Results<sup>1</sup> for additional electret locations, first quarter, 2005.

Sample Location	Net Corrected Exposure (uR/h)	± 2 SD (uR/h)
MP9 - 22/33	15.8 J	1.7
MP23 - 33	17.8 J	1.7
MP25 - 33	18.3 J	1.7
MP27 - 33	21.9 J	1.8
MP29 - 33	17.6 J	1.7
MP31 - 33	20.4 J	1.8
MP33 - 33	17.9 J	1.7
MP35 - 33	20.8 J	1.8
MP37 - 33	19.8 J	1.8
MP39 - 33	20.5 J	1.8
MP41 - 33	20.2 J	1.8
MP43 - 33	18.3 J	1.7
Mud Lake - Bank of Commerce	19.1 J	1.7
MP1 - Lincoln Blvd	18.5 J	1.8
MP5 - Lincoln Blvd	21.7 J	1.9
MP7 - Lincoln Blvd	20.5 J	1.9
MP9 - Lincoln Blvd	16.3 J	1.8
MP11 - Lincoln Blvd	20.2 J	1.9
MP13 - Lincoln Blvd	23.9 J	2.0
MP15 - Lincoln Blvd	22.0 J	2.0
MP17 - Lincoln Blvd	16.7 J	1.8
MP19 - Lincoln Blvd	22.0 J	2.0
MP21 - Lincoln Blvd	18.5 J	1.8
MP264 - 20	19.4 J	1.9
MP266 - 20	21.2 J	3.3
MP268 - 20	17.5 J	1.8
MP270 - 20	20.2 J	1.9
MP272 - 20	15.3 J	1.7
MP274 - 20	16.3 J	1.8
MP276 - 20	18.4 J	1.8
MP270 - 20/26	19.5 J	1.9
MP268 - 20/26	20.5 J	1.9
MP266 - 20/26	22.3 J	3.4
MP263 - 20/26	18.1 J	1.8
MP261 - 20/26	18.1 J	1.8
MP259 - 20/26	19.2 J	1.9
Howe Fence-line 1.4mi	17.8 J	1.7

<sup>1</sup> Data qualifiers: U = non-detection, J = estimate, R = rejected.

**Table C-1 continued.** Results<sup>1</sup> for additional electret locations, first quarter, 2005.

Sample Location	Net Corrected Exposure (uR/h)	± 2 SD (uR/h)
Howe Fence-line 2.3mi	20.5 J	1.8
Howe Fence-line 4.2mi	17.1 J	1.7
Howe Fence-line 6.5mi	19.4 J	1.7
Howe Fence-line 8.6mi	14.7 J	1.6
Howe Fence-line 9.7mi	19.2 J	1.7
Howe Met. Tower	19.2 J	1.9
<sup>1</sup> Data qualifiers: U = non-detection, J = estimate, R = rejected.		

## Appendix D

**Table D-1.** List of volatile organic compounds (VOCs) analyzed for water verification samples, first quarter, 2005. Minimum detectable concentrations (MDC) are expressed in µg/L.

Analyte	MDC
Benzene	0.5
Carbon tetrachloride	0.5
Chlorobenzene	0.5
1,4-Dichlorobenzene	0.5
1,2-Dichlorobenzene	0.5
1,2-Dichloroethane	0.5
1,1-Dichloroethene	0.5
cis-1,2-Dichloroethene	0.5
trans-1,2-Dichloroethene	0.5
1,2-Dichloropropane	0.5
Ethylbenzene	0.5
Methylene Chloride	0.5
Styrene	0.5
Tetrachloroethylene (PERC)	0.5
Toluene	0.5
1,2,4-Trichlorobenzene	0.5
1,1,1-Trichloroethane	0.5
1,1,2-Trichloroethane	0.5
Trichloroethylene	0.5
Vinyl chloride	0.5
Xylenes (total)	0.5
Bromodichloromethane	0.5
Dibromochloromethane	0.5
Bromoform	0.5
Chloroform	0.5
Bromobenzene	0.5
Bromochloromethane	0.5
Bromomethane	0.5
n-Butylbenzene	0.5
sec-Butylbenzene	0.5
tert-Butylbenzene	0.5
Chloroethane	0.5
Chloromethane	0.5
2-Chlorotoluene	0.5
4-Chlorotoluene	0.5
1,2-Dibromo-3-chloropropane (DBCP)	1.0
1,2-Dibromoethane (EDB)	0.5

**Table D-1 continued.** List of volatile organic compounds (VOCs) analyzed for water verification samples, first quarter, 2005. Minimum detectable concentrations (MDC) are expressed in µg/L.

Analyte	MDC
Dibromomethane	0.5
1,3-Dichlorobenzene	0.5
Dichlorodifluoromethane	0.5
1,1-Dichloroethane	0.5
1,3-Dichloropropane	0.5
2,2-Dichloropropane	0.5
1,1-Dichloropropene	0.5
cis-1,3-Dichloropropene	0.5
trans-1,3-Dichloropropene	0.5
Hexachlorobutadiene	0.5
Isopropylbenzene	0.5
p-Isopropyltoluene	0.5
Methyl Tert Butyl Ether (MTBE)	1.0
Naphthalene	1.0
n-Propylbenzene	0.5
1,1,1,2-Tetrachloroethane	0.5
1,1,2,2-Tetrachloroethane	0.5
1,2,3-Trichlorobenzene	1.25
Trichlorofluoromethane	0.5
1,2,3-Trichloropropane	0.5
1,2,4-Trimethylbenzene	0.5
1,3,5-Trimethylbenzene	0.5